FILON®

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FILON Translucent GRP Sheeting for Rooflights and Wall-lights

Keywords : - Roof Windows - Overlapping Sheets - Reinforced Plastics



FILON Rooflights used on British Car Auction Building in Bedford

Introduction

In April 2006 new Building Regulations were introduced with a view to saving energy and reducing the emission of Carbon Dioxide (CO_2).

For the first time every building design and construction is required to consider the total energy requirement of the building and is required to not only consider the thermal efficiency of the construction and fabric of the building, but also the efficiency of all the services - heating, lighting, air conditioning and hot water. The efficiency is not limited to KW hours but by related carbon emissions.

In the past rooflights have been considered less thermally efficient than the rest of the opaque roof, with the result that the more rooflights are reduced the more thermally efficient the building. What was not taken into consideration was that as the rooflights were reduced, the electric light was turned on powered by the National Grid using fossil fuels - considerably more carbon inefficient than leaving the rooflights in.

This document will address the new Regulations and show that rooflights should no longer be reduced in order to save energy, but increased to represent 20% of the roof area in order to save energy.

Filon Products - the Company

Filon Products are manufacturers of translucent flat and profiled GRP sheets for the roofing and cladding market. The company commenced production in 1957 with the first UK continuous manufacturing process. The process set new standards for quality, consistent thickness and profile definition. Constant development and strict quality control have maintained Filon's reputation as a symbol of quality for over 50 years. Sheets are manufactured in over 800 profiles to provide roof and wall lights to suit most metal and fibre cement profiled sheeting.

FILON sheets are unique to all other GRP translucent sheets in that they incorporate special light diffusing additives which scatter light passing through. This is particularly important when specifying ***chequer board*** or ***strip lights*** to ensure good light distribution and to reduce glare and excessive shadows. FILON sheets provide the natural ***pearl light bulb*** environment.

FILON sheets are manufactured from glass reinforced polyester resin in three fire retardant grades, with a UV resistant film to the weather surface to provide a long, durable, trouble free life usually well in excess of 25 years. For particularly aggressive chemical environments alternative FILON Citadel weathering surfaces can be provided.

Sheets can be supplied for single skin construction, factory assembled or site assembled double-skin construction and multi skin construction to fully satisfy the requirements of the 2006 UK Building Regulations for the **Conservation of Fuel and Power** required in Approved Document Part L2 (England and Wales) and Section 6: Energy, Building (Scotland) Regulations 2004.

When assembled as recommended, FILON rooflights can be fitted to be non-fragile to meet **HSE CDM Regulations**. When rooflights are required to remain non-fragile for the expected life of the roof, specify extra strong FILON Supasafe. These sheets are as strong, durable and impact resistant as 0.7mm thick profiled steel sheets. FILON Supasafe is manufactured to match most metal profiles.

For ***out of plane*** rooflights use FILON Monarch barrel vault rooflights. Typical ideal applications would be for ridge lighting, curved roofing, standing seam systems and flat roofs.

For additional information to this technical brochure please ask for the product brochures on :

FILON Profiles **FILON Citadel**
FILON Supasafe **FILON Monarch**

or additional technical data sheets on :

- **Guide to the use of FILON GRP to meet HSE Regulations**
- **Guide to the use of FILON GRP to satisfy the 2006 UK Building Regulations for the Conservation of Fuel and Power**

The above, along with information and literature for other Filon products, are available in hard copy, or download from our website: www.filon.co.uk.

Technical Quality and Data

Durability

All external weathering sheets are normally supplied with a highly durable UV resistant Polyester film to the weather face. This extends the durable working life of the sheet and the UV resistance limits sheet yellowing. Under normal atmospheric conditions sheet life should be in excess of 30 years.

Independent accelerated weathering tests completed under ISO 4892 and EN 1013-1 1997 **Light Transmitting Profile Sheeting**, confirms that FILON rooflights meet the highest durability classification under this standard.

Where very aggressive chemical environments exist FILON Citadel is available in opaque and translucent profiled sheeting. FILON Citadel sheeting is designed to withstand attack from aggressive chemical environments both inside and external to the building and is an ideal alternative to metal roofing and cladding where chemical corrosive activity is likely to exist.

Dimensions

FILON sheets are supplied as standard in any length up to 8m. Longer sheets can be supplied subject to quantity and additional haulage costs. Sheet width will be determined by the profile matched. Factory assembled double and triple skin units may have a length restriction dependant on specification.

Sheet Weight

Sheets are sold by weight - kilograms per square metre - rather than thickness. As the sheets are made heavier (thicker) they become stronger.

The normal range of weights is 1.83kg/m², 2.44kg/m² and 3.06kg/m². The sheet weight is dependant on:

- purlin centres.
- exposure to wind uplift and snow loadings.
- non-fragility CDM requirements.

Heavier weight sheets are available at 3.66kg/m², 4.0kg/m² and FILON Supasafe.

FILON Supasafe is designed to be as strong as 0.7mm steel by incorporating two additional reinforcement layers, yet retain a relatively thin sheet to provide good profile definition and good sheet sealing at end laps.

Fire Grade

FILON sheets, for roofing and cladding, are offered in three fire retardant grades. **Table 1** lists these grades and their fire performance when tested under BS 476 **Fire Tests**.

Table 1 : Grade and Fire Performance

FILON Grade	BS 476 Part 3	BS 476 Part 6	BS 476 Part 7
101	AA	(I) < 12[1] (i) < 6	Class 1
104	AA	(I) < 20	Class 1
300	AB	–	Class 3

[1] By definition under UK Building Regulations, FILON **Grade 101** sheets which have an index of performance of less than 12 and 6 when tested under BS 476 : Part 6, are designated **Class 0**.

For technical advice on which fire grade should be used in specific applications please refer to **Filon Technical Services Department**.

Manufacturing Tolerances

FILON sheets are manufactured to the following tolerances unless special arrangements have been made.

Table 2 : Tolerances

	Profiled Sheets	FlatSheets/Rolls
Length	Up to 2.5m long - 0mm + 20mm Over 2.5m long - 0mm + 0.8% of the stated length	Up to 2.5m long - 0mm + 6mm Over 2.5m long +/- 1% of the stated length
Width	+/- 0.8% of the stated width	+/- 2mm
Squareness	When a rectangular frame is placed at the end of the sheet, the variation from corner to corner shall not exceed 1mm in 100mm	

Colour

FILON sheets are described as ***natural translucent***. In addition to the scattered light transmission caused by glass filaments, a light diffuser is added during manufacture which distributes the transmitted light over a greater area. The effect is to reduce glare, discomfort and provide even balanced light over the entire floor area avoiding heavy shadows and dark corners. The light diffuser does not diminish the light transmission. It provides the *pearl light bulb* effect.

In addition to Natural Translucent, colour tints can be offered in almost any colour, and as more colour tint is added the sheet becomes semi opaque and subsequently opaque in that colour.

Opaque sheets are used to repair/replace asbestos cement roofs and as permanent cladding in lieu of metal sheeting in aggressive chemical environments.

Performance

Table 3 : Physical Properties - Typical Values

Thermal Conductivity (K)
Lee's Disc : 0.15W/m °C

Thermal Transmittance (U) : Value for Design Purposes
Single Skin : 5.7 W/m²K
Double Skin :
Triple Skin : } **See Table 10**
Multi-Skin :

Thermal Movement
Coefficient of Linear Expansion : 25 x 10^{-6} per °C

Operating Temperatures
-20°C to +100°C

Light Diffusion : Gradient Constant (Table 2 : BS 4154) :
Classification II - Moderately Diffusing
Note that this classification applies to natural translucent sheeting.

Light Transmissions (Natural Translucent) : Percentage Natural Daylight by Direct Contact Photo Cell and subject to specification.
Single Skin : 85% - 90%
Single Skin Supasafe : 85%
Double Skin : 72% - 81%
Triple Skin : 65% - 79%
Multi-Skin : 55% - 70%

Shading Coefficient (Natural Translucent) :
Natural Translucent - Single Skin : 85
- Double Skin : 75
Based on solar calorimeter tests completed by the National Building Research Institute, Pretoria, South Africa.

Liquids
Water absorption 0.25% after 24 hours at 20°C

Biological
Resistant to attack by micro-organisms, fungi, larvae, insects and mildew. Wash with mild detergents to remove deposits.

Effects of Sunlight
The outer surface of flame retardant panels may yellow after prolonged exposure. This does not significantly affect the colour of light transmitted. Tinted and opaque panels fade evenly.

Compatibility
No chemical reaction with other established construction materials

Table 4 : Structural and Mechanical - Typical Values

	Standard Weight GRP	FILON Supasafe
Nominal Panel Weight (kg/m²)	1.83/2.44	4.5
Nominal Thickness (mm)	1.00/1.40	2.5
Tensile Strength (N/mm²)	80	140
Flexural Strength (N/mm²)	180	300
Flexural Modulus (kN/mm²)	4.0	5.0
% Glass Content	32	32
Barcol Hardness	50	60
Impact Strength (Joules) Single Drop	530/1060	2200

Support Centres

To meet the structural requirements on buildings not exceeding 10m high eaves with normal exposure and permeability, **Tables 5 and 6** list the recommended support centres for alternative profile depths and weights of sheets and lining panels.

For buildings in excess of 10m height to eaves or sited in coastal or other exposed locations, it may be necessary to reduce the purlin centres or supply heavier (thicker) weight sheets. Discuss specific details with Filon Technical Services Department.

Table 5 : Guide to Maximum Centres of Supports - Roofing and Cladding Profiles

Overall Depth of Corrugation in mm	Sheet Weight		
	1.83 kg/m²	2.44kg/m²	Supasafe
15 - 20	1.00m	1.25m	1.60m
21 - 25	1.50m	1.80m	2.40m
26 - 30	1.75m	2.10m	2.80m
31 - 35	1.80m	2.20m	2.90m
36 +	2.00m	2.25m	3.00m

Table 6 : Guide to Maximum Centres of Supports - Lining Panels

Overall Depth of Corrugation in mm	Continuous Run Applications [1]			Chequer Board Applications [2]		
	Sheet Weight kg/m²					
	1.83	2.44	Supasafe	1.83	2.44	Supasafe
15 - 20	1.6m	2.0m	2.2m	1.8m	2.2m	2.4m
21 - 25	2.0m	2.2m	2.6m	2.2m	2.4m	2.8m

[1] Liners fixed side by side to one another each sheet overlapping and underlapping at side laps.

[2] Single Chequer Board or single ridge to eaves where each side lap is placed over and supported by the side lap of the adjacent metal or fibre cement sheet.

NB To meet non-fragility requirements as detailed in **Table 7** purlin centres are stated as between 1.35m to 2.0m. For purlin centres outside this range and satisfying CDM non-fragility requirements refer to **Filon Technical Services Department.**

For Factory Assembled Rooflights, when used in conjunction with metal composite panels, it is recommended that the purlins are linked by the sag rods to ensure spacing centres remain constant when loaded out. Failure to do this may require the use of additional support plates to ensure fixings are correctly located in the support structure. Full details on this recommendation is available in the guidance document "**Best Practice for the Specification and Installation of Metal Cladding and Secondary Steelwork**" published by the Steel Construction Group.

Daylighting

Daylighting is essential for healthy living. In business it is an established fact that ample daylight brings significant productivity and safety benefits from a general feeling of health and well being in the work force.

Under the 2006 UK Building Regulations for Conservation of Fuel and Power Part L2 (non domestic), the Notional Building is defined with 20% rooflights. As rooflight area is reduced below 20%, the use of electric lighting within the building will increase, thereby increasing the energy demand on the building. **Full details on the requirements to meet Part L 2006 are given on page 9.**

Wall lighting (windows) should be a minimum of 20% of the wall area, but it is necessary to understand that windows only provide effective illumination within 6m of the wall.

Rooflighting for wide and multi-span buildings is the only effective method of providing natural daylight to all working areas within the building. Rooflighting is generally three times more efficient than windows.

As lighting requirements vary between different operational zones or possibly changes of use, the primary need should be to ensure an even overall level of illumination. When high levels of local lighting are necessary, supplementary lighting should be considered.

Methods of Rooflight Construction & Fixing

As a general rule of thumb ***in plane*** rooflights are easily fixed since they are generally the same profile as the surrounding sheets and fixed in the same manner as the metal or fibre cement sheeting except for the following comments :

- Filon translucent sheets to match metal profiles - external sheets, see **Figs.1** and **2**.
  - Main Fixings - Screws with minimum 29mm dia. washers at maximum 200mm centres located in the troughs. Cover caps in poppy red are recommended.
  - Side Lap Fixings - Stitch screws and/or Grommet type stitch fixings or similar at maximum 450mm centres.
  - Sealant - All laps sealed generally as opaque sheets.

- Filon translucent sheets to match metal profiles - liner sheets, see **Figs. 1** and **2**.
  - Main Fixings - Five fixings per metre width with 29mm dia. washers.
  - Side Lap Fixings - Seal with 50mm wide shear resistant tape.

- Filon translucent sheets to match fibre cement profiles - external sheets.
  - Main Fixings - Fix through the crowns using purpose made washers with ideally five fixings per metre width.

Rooflight Configurations

Single Skin: Use only on unheated buildings e.g. stadia, agricultural use, domestic garages, canopies.

Double Skin: Use only for refurbishment or repair to existing heated buildings built before April 2006. For major refurbishment, triple skin may be required to comply with ADL2B (2006).

Triple/Multi Skin: From April 2006 all new build rooflights are required to have a minimum performance of U-value 2.2W/m²k. This will require a minimum of 3 light transmitting skins that make up the rooflight. These rooflights may be assembled on site (see **Figs.1, 2, 3**), or factory assembled (see **Figs 4 and 5**).

Barrel Lights: Prefabricated units fitted to site constructed upstands on curved, flat and sloping roofs, plus ridge line assembly (see **Figs 6 and 7**).

Fig. 1 Site Assembled - structured polycarbonate core

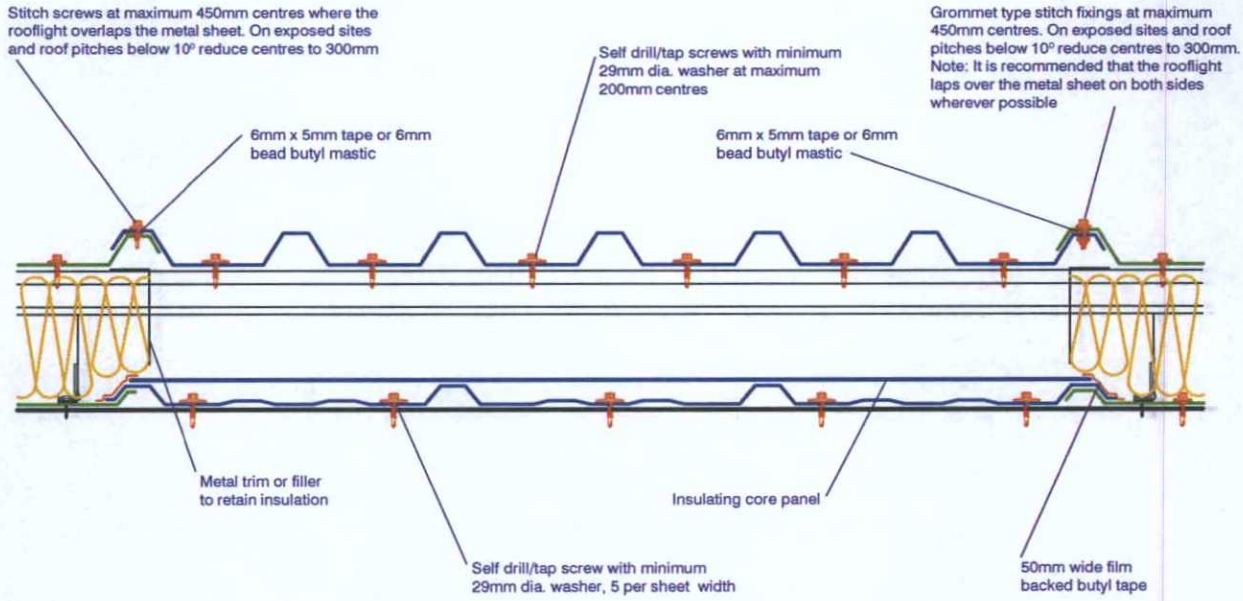


Fig. 2 - Site Assembled - structured polycarbonate core

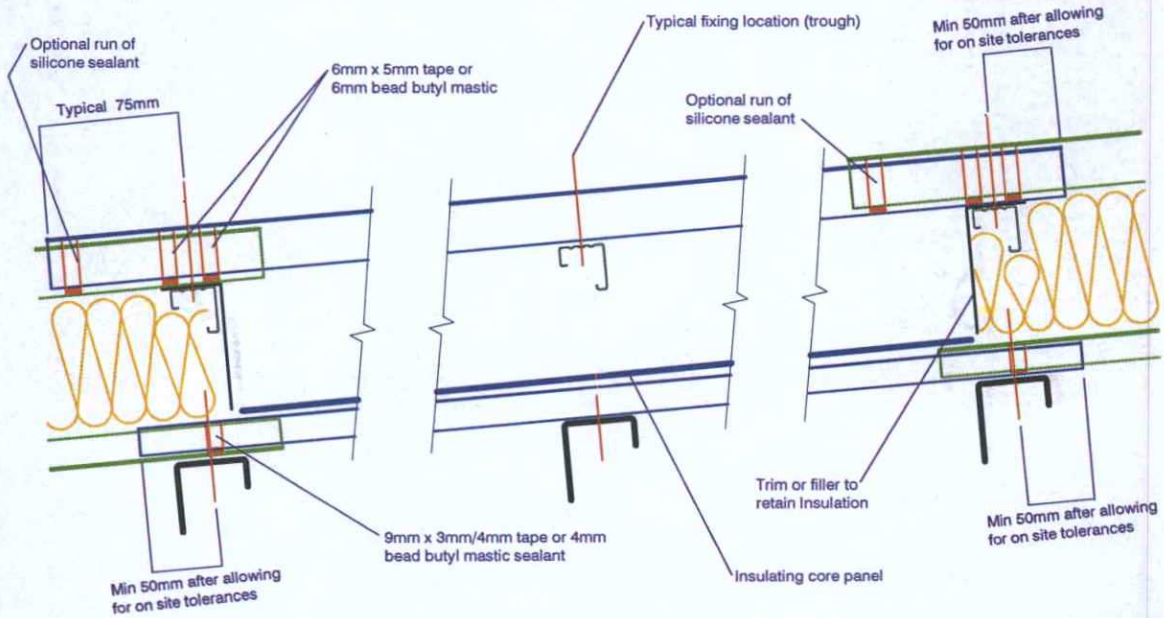


Photo - Showing Structured Polycarbonate Core



Fig. 3 - Site Assembled Filon Fermacore (GRP)

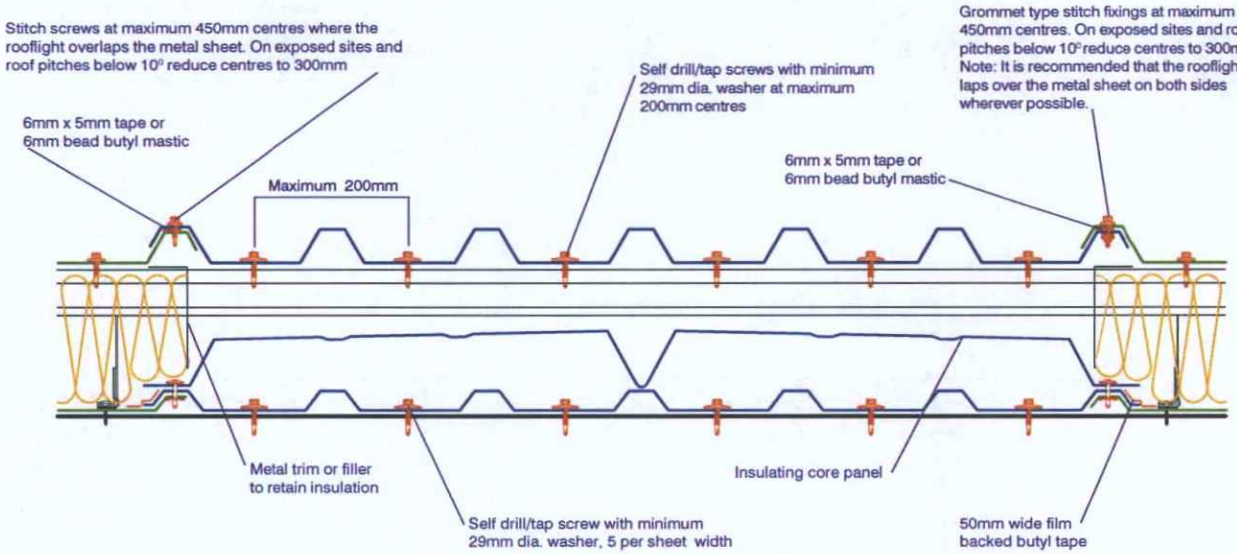


Photo - Showing Fermacore GRP Panel

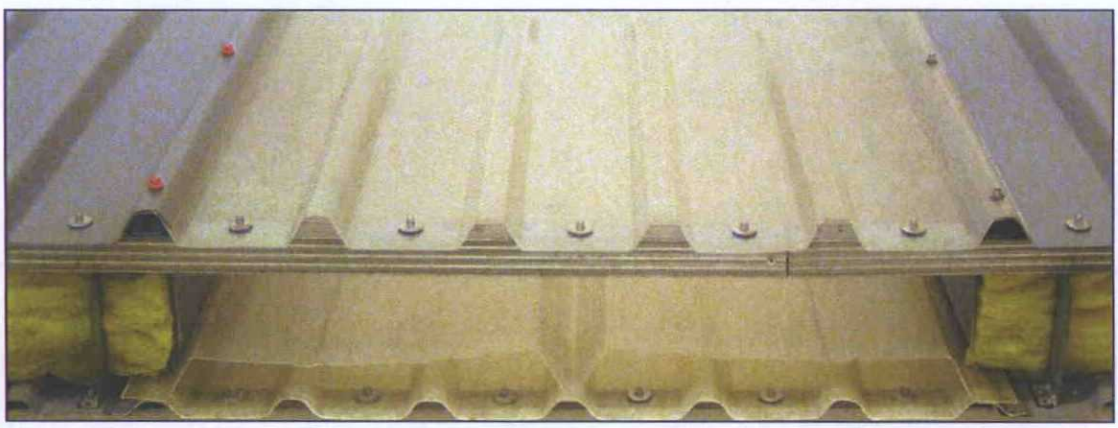


Fig. 4 - Factory Assembled Filon Filotherm

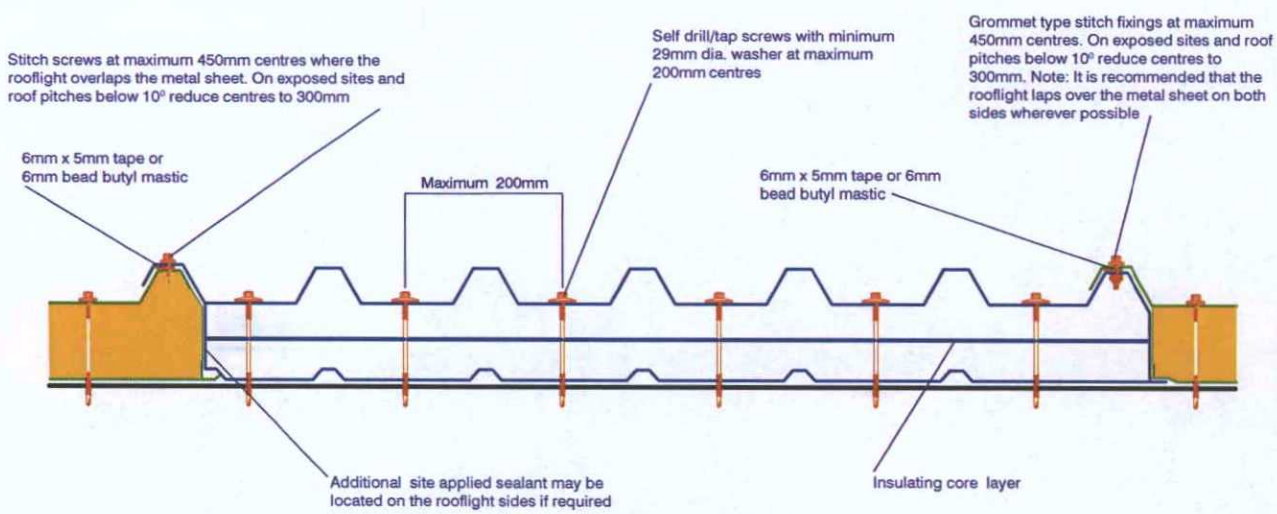


Fig. 5 - Factory Assembled Filon Filotherm

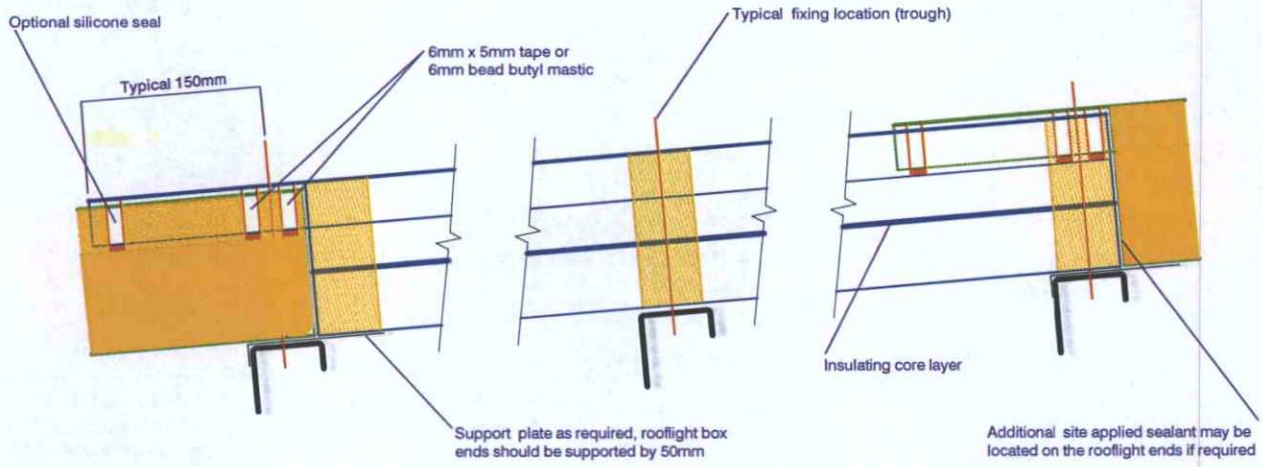


Fig. 6 - FILON Monarch Barrel Light - Cross Section (typical)

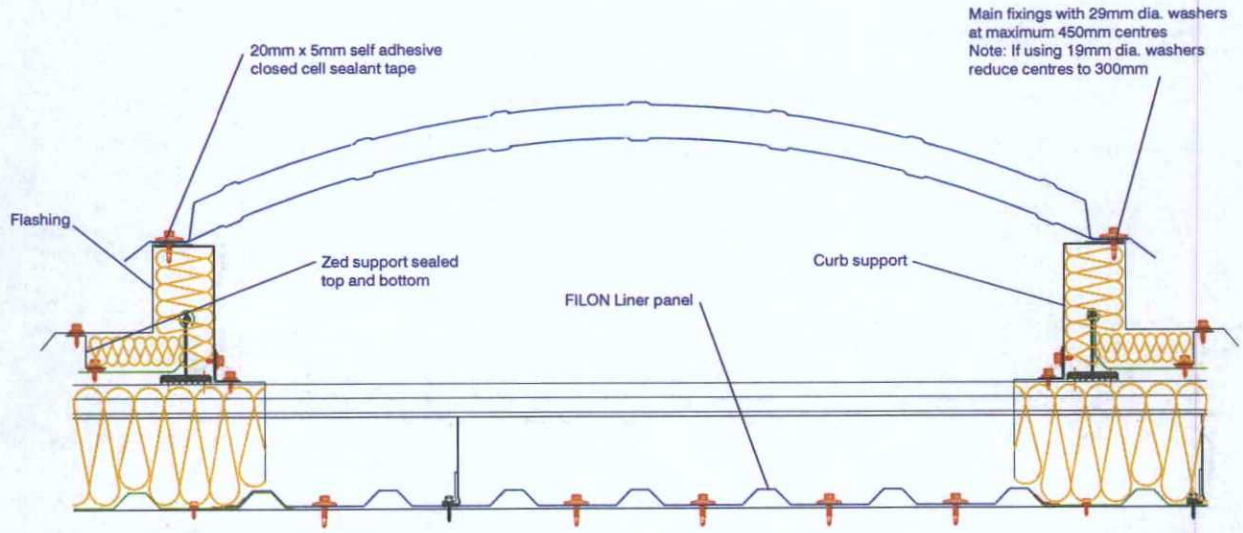
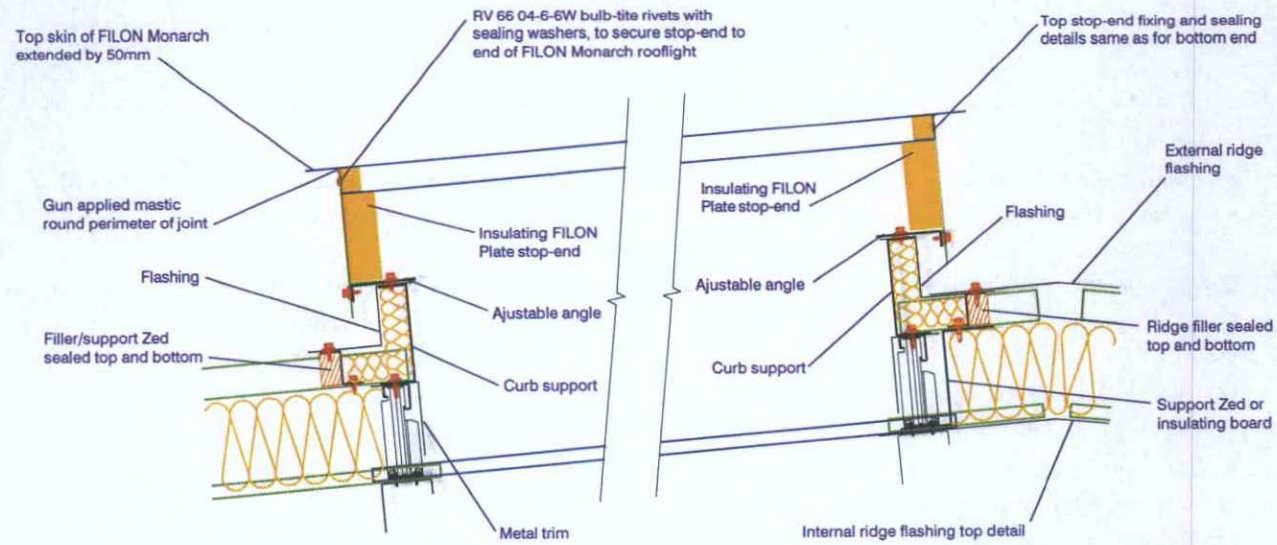


Fig. 7 - FILON Monarch Barrel Light - Longitudinal Section (typical)



Application - HSE CDM Regulations

The **HSE CDM Regulations** recommend that non-fragile roofs should be specified. *Non-fragility* is determined under the test method detailed in **ACR[M]001:2005 - Test for Non-Fragility of Profiled Sheeted Roofing Assemblies** (third edition).

As **ACR[M]001:2005** is an impact test completed on a fixed roof, rather then testing individual components, it is essential that rooflights must be fixed in accordance with Filon's recommendations.

The normal fixing specification requires both the rooflights and liners to be fixed at centres not exceeding 200mm to purlins or other supports spaced at centres between 1.35m and 2.0m.

Provided rooflights are installed in a normal environment with fasteners having the equivalent durability of the rooflights, the requirements to achieve non-fragility when new, to remain non-fragile for 25 years, and to remain non-fragile for the expected life of the steel roof, are given in **Table 7**.

Table 7: FILON Rooflights to Meet *Non-Fragile* Specification

Application	*Non-Fragile* Classification	Min.Weight for *Non-Fragile* when New	Min.Weight for *Non-Fragility* for 25 Years	Min.Spec. for *Non-Fragility* for Life of Roof
Single Skin Sinusoidal Profile for use with fibre cement	Class C	2.44kg/m²	3.06kg/m²	FILON Supasafe
Single Skin Profile for use with metal roofs	Class B	3.06kg/m²	3.66kg/m²	FILON Supasafe
Site Assembled used in conjunction with 0.4mm Steel Liners				
- **Performance of liner panel alone**	Class C	2.44kg/m²	2.44kg/m²	2.44kg/m²
- **Assembly with Class C liners (lining out first)**	Class B	Outer 1.83kg/m² Liner 2.44kg/m²	Outer 2.44kg/m² Liner 2.44kg/m²	Outer Filon Supasafe Liner 2.44kg/m²
- **Assembly (not lining out first)**	Class B	Outer 2.44kg/m² Liner 1.83kg/m²	Outer 3.06kg/m² Liner 1.83kg/m²	Outer Filon Supasafe Liner 1.83kg/m²
Site Assembled used in conjunction with 0.7mm Steel Liners				
- **Performance of liner panel alone**	Class B	3.06kg/m²	3.06kg/m²	3.06kg/m²
- **Assembly with Class B liners**	Class B	Outer 1.83kg/m² Liner 3.06kg/m²	Outer 1.83kg/m² Liner 3.06kg/m²	Outer FILON Supasafe Liner 3.06kg/m²
Factory Assembled Insulating Rooflights (Filotherm) - **For use with Composite Panels with liners over purlins**	Class B	Outer 2.44kg/m² Liner 1.53kg/m²	Outer 3.06kg/m² Liner 1.53kg/m²	Outer FILON Supasafe Liner 1.53kg/m²
- **For use with liner box between the purlins**	Class B	Outer 3.06kg/m² Liner 1.53kg/m²	Outer 3.66kg/m² Liner 1.53kg/m²	Outer FILON Supasafe Liner 1.53kg/m²
FILON Monarch Factory Assembled Barrel Vaults	Class B	Outer 1.83kg/m² Liner 1.83kg/m²	Outer 2.44kg/m² Liner 2.44kg/m²	Outer FILON Supasafe Liner 1.83kg/m²

Notes to Table 7

1. All specifications stated are based on purlin centres of 1.35m to 2.0m. Both closer and extended purlin centres can adversely effect performance of the *non-fragility* rating. Specific tests may be carried out to verify the requirement, but a safe rule is to increase the rooflight sheet weight.
2. Curved roofs will adversely effect sheet performance since the sheet is stiffer. A safe rule is to increase the rooflight sheet weight.
3. Current fibre cement sheets manufactured in the UK are currently Class C. These sheets may not provide ***non-fragility*** for 25 years or for the life of the roof.
4. For repair work on asbestos cement roofs, regardless of rooflight thickness, the whole roof will be ***fragile***.
5. For external profiled sheets with a profile depth less than 25mm, the sheet weight should be increased to 2.44kg/m² to achieve required spans.
6. For full specification detail on Filon Supasafe refer to FILON Supasafe technical brochure available from Sales or Technical departments.

Application - Fire Regulations

Compliance to meet the UK Building Regulations are met by testing the rooflight sheets to BS 476 Part 3, Part 6 and Part 7, application of which is provided in **Table 8**.

Table 8 : Fire and Building Regulations

FILON Grade	Application
101	Use to meet **AA** and **Class 0** specifications, and on vertical applications exceeding a height of 18m and less than 1m from boundary.
104	Use to meet **AA** and **Class 1** specifications, and on vertical applications less than a height of 18m and more than 1m from boundary.
300	Use to meet **AB** and **Class 3** specifications.

For further advice and recommendations consult **Filon Technical Services Department**.

Application - Conservation of Fuel and Power Regulations April 2006

New Part L Regulations were introduced in April 2006 to further increase building efficiency to conserve fuel and power. The new regulations supersede the Part L 2002 Regulations, but use the Notional Building defined in the 2002 Regulations as a starting point to value the improvements required and achieved. The new Regulations apply to all new build where buildings are to be heated, and also apply to extensions and refurbishments to existing buildings.

The 2002 Regulations only considered the thermal values of the building elements. Under the 2006 Regulations, it not only considers these thermal values, but also considers the efficiency of the heating, lighting, lighting control, hot water and air tightness. The total energy requirement for the building is calculated using Government approved software called **Simplified Building Energy Model** (SBEM). The total energy requirement for any specific building is called BER - **Building Emissions Rate**, and this BER is compared with the Notional Building of the same size, use and general design under the 2002 Regulations.

To be compliant under the 2006 Regulations the building needs to achieve a TER - **Target Emission Rate**. When compared to a Notional Building (2002) the TER for any non mechanically ventilated building is 76.5% (saving of 23.5%), and for a mechanically ventilated building the TER is 72% (saving of 28%).

Achieving Compliance - Rooflights Save Energy

In the past, designers have considered a reduction of rooflight area to minimise heat loss due to the lower thermal performance of rooflights compared with opaque roof areas. The result is a high use of artificial lighting. Research has been carried out by De Montford University that shows that the total (heating and lighting) energy demand for a building will reduce as the rooflight area is increased with the optimum being around 20% of the floor area.

This data is now confirmed when applied in SBEM such that as the rooflight area is reduced from 20% (2002 Notional Building), the energy demand BER increases as the artificial light comes on to compensate for the reduced level of natural light.

The optimum rooflight area, to minimise energy demand, will generally be 20% of the floor area.

Lighting Controls

None of the above energy efficiency works if regardless of the rooflight area, the artificial lights are switched on in the morning and remain on all day. The key to energy efficiency is to install artificial lighting controls using sensors and dimmers that allow for the correct lux levels for that specific area at all times of the day (and night).

ADL2A Limiting U-Values

The purpose of the new Regulations is to allow greater freedom of choice of materials and design provided the TER is achieved. However the regulations do provide for some limiting values. Maximum thermal U-values of the fabric of the building are defined in **Table 4** to ADL2A, which for rooflights are given below:

Table 9: Limiting U-Value Standards (W/m²K)

Element	(a) Area Weighted Average	(b) For any Individual Element
Wall	0.35	0.70
Floor	0.25	0.70
Roof	0.25	0.35
Windows, Roof Windows **Rooflights**, Curtain Walling	**2.20**	**3.30**

The solution for Filon GRP rooflights is to install FILON site assembled or factory assembled units with a U-value no worse than 2.2. This will now be the norm for all new build work. The odd double skin rooflight with a U-value of 3.3 will be acceptable provided the average for all rooflights on the building is 2.2.

Filon Rooflight U-values

The U-values given in **Table 10** relate to typical design and profile configuration as shown earlier in **Figs. 1** to **7**.

Table 10 : FILON Rooflight Typical Design U-values and Minimum f-values

Construction	Cross Section	U-value W/m²K	f-value (Min)
Site Assembled Double Skin		3.0	0.69
Factory Assembled Double Skin		3.0	0.69
FILON Site Assembled Structured Polycarbonate Core	Figs.1, 2	1.8 - 1.0	0.80
FILON Fermacore Site Assembled	Fig.3	2.2	0.80
FILON Filotherm Factory Assembled	Fig.4 & 5	2.2 - 1.0	≥0.80
FILON Monarch Barrel Lights - Triple Skin	Fig.6 & 7	2.2 - 1.0	≥0.80

NB Site Assembled liners are assumed to have a profile depth of 20mm. Deeper profile liners could affect the U-value calculations.

ADL2B - Extentions and Refurbishments

When reading ADL2B, a key point to understand is that "**rooflights**" are not a "**thermal element**", they are "**controlled fittings**" and have their own set of requirements that are detailed in **Table 5 to ADL2B.** Please note that the current version (April 2006) of **Table 5** is incorrect. In the first line to the Table, a line has been left out in error. The first line should be :

"Windows, Roof Windows & Glazed Rooflights"

Beneath this and in the same box should be:

"Plastic Rooflights (a) 2.2 (b) 2.2"

(a) U-value Standards for new rooflights in extensions

(b) U-value Standard for replacement rooflights in existing buildings

This is saying, as for ADL2A, all FILON rooflights, for both extentions and replacements during refurbishment where there is a need to comply with ADL2B, should have a U-value no worse than 2.2 W/m²K.

When does ADL2B Apply to Extentions and Repair/Refurbishment

Extentions

The following conditions will apply:

a) Large extensions that are greater than 100m² **and** greater than 25% of the floor area of the existing building are to be regarded as new buildings and comply to ADL2A.

b) Conservatories less than 30m² are exempt from Building Regulations and exempt from ADL2.

c) For existing buildings that exceed 1000m² floor area, an extension will trigger Consequential Improvements to the original building.

Other than applies above, extensions will be compliant if built to the Elemental Method and subject to given design constraints. In this respect, rooflights are constrained by allowable U-values and allowable rooflight areas. For rooflight U-values, reasonable provision will be if the U-values comply with **ADL2B Table 5** as stated above.

For allowable rooflight area to the extension, this is limited to **ADL2B Table 2 – Opening Areas in the Extension**. For all extension types, the rooflight area is limited to 20% of the roof area. However, also note, that where the existing building has in excess of 20% rooflight area, a reasonable provision for the extension will be to have a rooflight area which is limited to the same area as the original building to which the extension is attached.

Repair and Refurbishment

The Guidance Document says that wherever an element is being replaced, then it should be to a standard that will be compliant to the 2006 Regulations. If rooflights need replacing, for whatever reason, then compliance will be achieved if supplied in accordance with **ADL2B – Table 5** (when amended) to a U-value of 2.2 W/m²K.

There is no requirement where one or a number of rooflights are to be replaced – then all the rooflights should be replaced. The only requirement is that those that are replaced, meet the new standard as above **and provided** it is economical and feasible to do so.

Consequential Improvements

Where an existing building has a floor area over 1000m², and work is to be carried out on the building by way of an extension, initial provision or increase in installed capacity of any fixed building services, then there is a requirement for some consequential improvement to the building to improve the energy performance of the original building.

Consequential improvement will be deemed to be satisfied if:

a) The improvements achieve a **simple payback** of not more than 15 years, i.e. the cost of improvement over the savings in energy cost over 15 years. **Simple Payback** is defined in **Section 5 ADL2B,**

or

b) The cost of improvement was no more than 10% of the value of the **principal work** , i.e. the cost of the extension or the service upgrade. **Principal work** is defined in **Section 5 ADL2B.**

The Guidance Document provides a list of 8 practical solutions to upgrade the original building that are shown in **ADL2B Table 1 – Improvements that in ordinary circumstances are practical and economically feasible. Item 7** identifies "Replacing existing windows, roof windows or rooflights or doors which have a U-value worse than 3.3 W/m²K, following the Guidance to **ADL2B Table 5 – Standards for Controlled Fittings"**.

Since there will be a basic requirement to upgrade the original building in line with the financial limits stated, there will be considerable advantage to selecting **Item 7** as one of the improvements costs since:

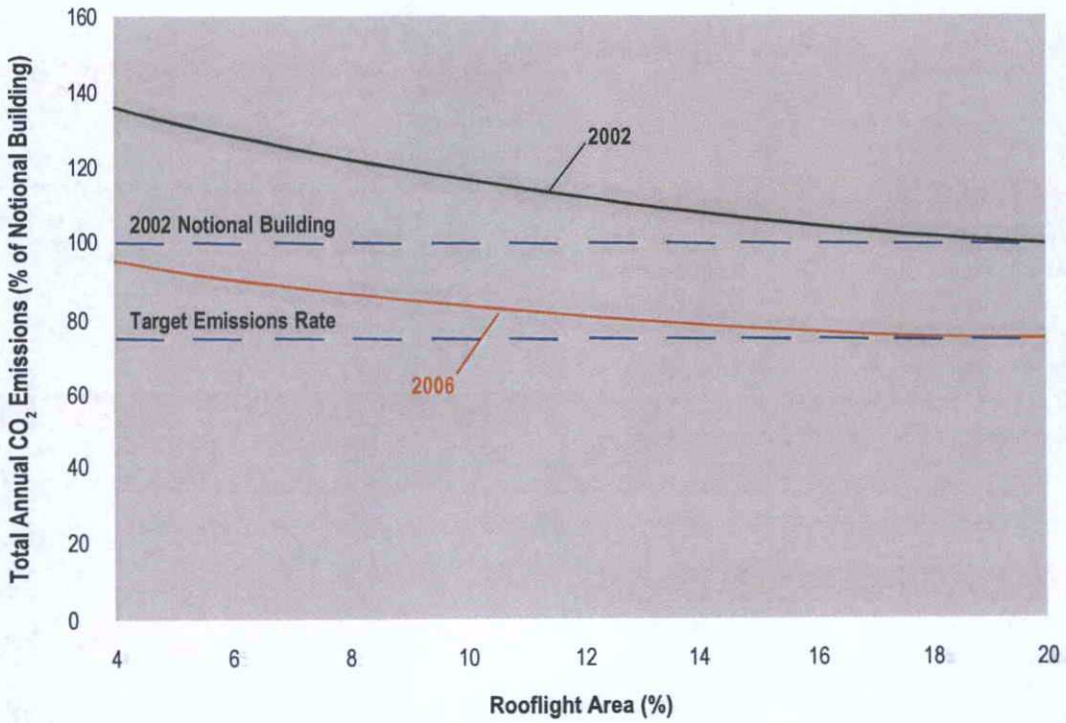
- There will be considerable thermal efficiency savings by replacing old rooflights at a U- value of 5.7 W/m²K to new rooflights at a value of 2.2
- The old rooflights may have lost a large part of their light transmitting qualities – new rooflights will put daylight back intothe building to make it a more pleasant place to work
- The additional daylight will mean the electric lights can be switched off creating further considerable energy savings
- The new rooflights will be non-fragile making the roof a safer place should maintenance staff need to access the roof. (Note that the opaque roof areas may also be fragile and will remain so after the rooflights have been replaced).

Conclusions on Part L - 2006

1) The new Part L (2006) Regulations require, as a general rule, that all FILON rooflights have a U-value of no worse than 2.2 W/m²K
2) There is a recognition from Government that good natural daylighting is carbon efficient provided the electric light is switched off. In practice carbon efficiency is maximised at 15% to 20% rooflight area.
3) On Extensions or Refurbishment work where Consequential Improvements are required on the existing building, a useful solution is to replace the old single skin rooflights improving the U-value from 5.7 to 2.2W/m²K to achieve the 10% consequential improvement and the additional benefit that the environment within the building will be a far more pleasant place to work.
4) The use of 20% rooflights at a U-value of 2.2W/m²k is a basic requirement of the Notional Building (2002 Regs) andwill provide the basis of a BER at 100%. To achieve the necessary carbon savings to a minimum BER at 76.4%, further savings must be achieved in building design, services and air tightness. If less than 20% rooflight area is used, the BER will increase, requiring even further savings in design, services and air tightness.
5) The use of 15% - 20% rooflights, will not only provide energy savings, it will provide a very pleasant environment for people working in the building leading to greater work efficiency, less accidents and an improvement in the feel good factor.

Effect of Rooflights on CO_2 Emissions

Fig. 8 CO_2 Emissions Compared to Typical Notional Building



The Notional Building is designed to 20% rooflights at a U-value of 2.2W/m²K. The Graph Demonstrates that as the rooflight area is reduced, the overall CO_2 emissions increase. The 2002 line shows a typical building with 20% rooflights giving 100% compliance.

Under Part L 2006 the TER is below 80%. The 2006 line demonstrates that as the rooflight area is reduced, compliance can only be achieved by making energy savings in other areas of design. Maximising the rooflight area to 20%, minimises the problem of seeking other energy saving designs

Health and Safety

All rooflights and rooflight liners must be considered fragile until they are correctly fixed as recommended.

Roof works should be completed in accordance with the recommendations published in the Health and Safety Executive Guidance Note HS (G) 33 "Safety in Roof Work".

Many accidents occur during maintenance and cleaning. Very often work is carried out by those who have no experience or understanding of working at heights.

Roofs are dangerous places to work and it is recommended that the following information is included in the **"Health & Safety File"**.

No person should have access to a roof unless under the direct supervision of an experienced roofer who should be sufficiently competent to assess any risks and take the necessary action to reduce such risks. Although designed to be ***non-fragile*** when installed, foot traffic on rooflights may damage and weaken the sheets and is likely to damage the UV resistant protective coating thereby reducing the life and translucent qualities of the sheet.

Do NOT walk on rooflights at any time, ALWAYS use crawling boards.

Insurance

Industrial insurance in the United Kingdom is generally based on **The Loss Prevention Council Insurance** rules for the fire protection of industrial and commercial buildings. This is published in the council's **Code of Practice for the Constructions of Buildings**. As these rules differ from statutory requirements, and fire insurance costs are a continuing overhead, it is essential that designers should co-operate and agree specifications with insurers at the design stage of the project.

Design

To minimise risks to future maintenance personnel, it is recommended that rooflights should not be located adjacent to valley or boundary wall gutters or within 2m from exposed roof edges.

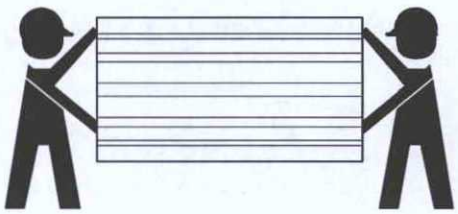
Siteworks

Transport, Handling and Storage

Sheets are generally supplied loose. Store sheets on flat, clean, level battens located at 1.5m centres. Secure against theft and from being blown away.

Continuously protect sheets stored in open with waterproof opaque covers, otherwise even on relatively dull days sheet stacks will act as a **solar battery** boiling any entrapped moisture and possibly discolouring the sheets. Inspect regularly to ensure that moisture has not penetrated the stack.

When carrying Factory Assembled Insulating Rooflights (FAIRS), **care must be taken not to twist them**. They must be carried by at least two people, as illustrated, wearing the appropriate PPE.



Maintenance

Sheets should be regularly cleaned with warm water and detergents to maintain light transmissions.

FILON sheets will remain structurally sound for at least 30 years. If required, the exposed surface of rooflights may be refurbished with a purpose made coating to restore the light transmission and to prolong the life of the sheets.

Supply

Sheets are generally manufactured to order and can be obtained through a nationwide network of distributors and major roofing contractors.

Technical Services

Technical and advisory services are available from Area Sales Managers or Filon Technical Services Department.

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NARM NATIONAL ASSOCIATION OF ROOFLIGHT MANUFACTURERS

The Metal Cladding and Roofing Manufacturers Association

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